

REMARKS/ARGUMENTS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claims 1-35 are presently active in this case, Claims 1, 14, 27, and 31 having been amended by the present amendment. Claims 32-35 have been presently added. No new matter was added.

In the outstanding Official Action, Claims 1, 2, 4, 27, 28, and 31 were rejected under 35 U.S.C. §103(a) as being unpatentable over Bethune et al (U.S. Patent No. 6,188,768) in view of Moeller et al (U.S. Patent No. 6,538,787); Claims 3, 13, and 30 were rejected under 35 U.S.C. §103(a) as being unpatentable over Bethune et al in view of Moeller et al and in further view of Lauzon (U.S. Patent Application Pub. 2004/0165808); Claims 5-8, 10, 14-16, 19, 21, and 23-26 were rejected under 35 U.S.C. §103(a) as being unpatentable over Bethune et al in view of Moeller et al and in further view of Blow (U.S. Patent No. 5,757,912); Claim 9 was rejected under 35 U.S.C. 103(a) as being unpatentable over Bethune et al in view of Moeller et al and in further view of Blow and in further view of Lauzon (U.S. Patent Application Pub. 2004/0165808); Claim 11 was rejected under 35 U.S.C. §103(a) as being unpatentable over Bethune et al in view of Moeller et al and in further view of Blow and in further view of Reingand et al (U.S. Patent Application Pub. 2003/0058499); Claim 29 was rejected under 35 U.S.C. 103(a) as being unpatentable over Bethune et al in view of Moeller et al and in further view of Szafraniec (U.S. Patent Application Pub. 2002/0122180); and Claims 12, 17, 18, 20, and 22 were objected to as being dependent upon a rejected base claim but would be allowable if rewritten in independent form.

Applicants acknowledge with appreciation the indication that Claims 12, 17, 18, 20, and 22 include allowable subject matter. However, since Applicants consider that the

amended independent claims are allowable, Claims 12, 17, 18, 20, and 22 have presently been maintained in dependent form.

Further, Applicants acknowledge with appreciation the courtesy of Examiner Le and Primary Examiner Shi to interview this case with Applicants' representatives on January 14, 2007 during which time the issues in the final Office Action were discussed, as substantially summarized hereinafter.

During the interview, Bethune's Figure 2 and Applicants' Figures 1 and 8 were discussed. The primary examiner expressed a concern about the previously recited "unknown polarisation projected onto a first polarisation state or a second polarisation state" which in his view may not be properly supported and may not be properly characteristic of the invention.

In response, Applicants have clarified Claim 1 to define a photon emitter including:

a photon generator configured to generate *randomly polarized* photons separable into a first polarisation state and a second polarisation state; and *time delay means receiving said randomly polarized photons* and being configured to delay photons having the second polarisation state with respect to those having the first polarisation state such that photons which enter the time delay means with the first polarisation exit the time delay means at a different time to photons which enter the time delay means with the second polarisation. [Emphasis Added.]

Support for these clarifications (and the new claims) are found in the specification on page 20, lines 13-17, which states that:

The single photon pulses are generated by a single photon source 107. Typically each single photon pulse has a duration of $d_{sps}=100$ ps - 1 ns. The single photons are emitted with a random polarisation or a random mixture of two orthogonal polarisations. The present scheme can make use of all the emitted polarisation states.

Photons emitted by the single photon source 107 are routed into a polarising beamsplitter 109 which separates the path of photons in two orthogonal polarisations.

Regarding the art rejection: M.P.E.P. § 2143.03 requires, to establish a case of *prima facie* obviousness, all the claim limitations must be taught or suggested by the prior art.

As discussed during the interview, Bethune's Figure 2 shows a polarising beam splitter 46 which ensures that any vertically polarised photons outputted by diode laser 12 are rejected (column 5, lines 7 to 9). The horizontally polarised photons are then converted to photons with polarised states of $\pm 45^\circ$. These ***polarised photons*** then impinge on beam splitter PBS 1 and are either directed along path (1) into delay line 18 followed by the path to second channel end 20 and back to PBS 1 path (2) to second channel end 20 then to delay line 18 then to PBS 1. Therefore, although the photons follow two paths through the system, it is the polarized photons in Bethune with well-defined polarizations (and not randomly polarized photons as presently claimed) that are received by the time means.

Hence, Applicants submit that the feature of randomly polarized photons being received by a time delay means is a feature not taught or suggested in Bethune.

Moeller et al was applied in the Office Action for their asserted teaching of a time delay means receiving photons with an unknown polarization. See Office Action, page 4, lines 9-13. Yet, Moeller et al precisely describes that a polarizing beam splitter PBS1 "separates arbitrarily polarized input signal into transverse electrical (TE) and transverse magnetic (TM) modes." See col. 4, line 66, to col. 5, line 2.

Applicants firstly submit that an arbitrarily polarized input signal in Moeller et al does not disclose or suggest a randomly polarized signal. Moeller et al is concerned with the emulation of polarization mode dispersion in which a frequency dependent variation in the polarization state of the light injected into a fiber, which will result in pulse distortion. See col. 1, lines 35-37. To know the effect of polarization mode dispersion, then Moeller et al would need to emulate the effect for various injected polarized signals. To randomize the

polarizations would defeat the purpose of Moeller et al's emulation. Moreover, even if the examiner otherwise construes the arbitrarily polarized input signal in Moeller et al to be randomly polarized or to be suggestive of randomly polarized, then the examiner's attention is directed to Figure 2 of Moeller et al and the Office Action's assignment of the elements of Figure 2 to the claim terms. The Office Action identifies the Mach-Zehnder interferometer MZ1 as a time delay means. Under that reading, Figure 2 of Figure 2 shows that the inputs to the Mach-Zehnder interferometer MZ1 are the beam split polarized components TE and TM. Like Bethune, Moeller et al includes a polarizing beam splitter PBS1 and includes in one leg a fiber F2 to physically rotate the polarization fields TE and TM from the arbitrarily polarized input signal such that polarized light components F1 and F2 are parallel before entering the time delay means (i.e., that is before entering). Specifically, Moeller et al states at col. 5, lines 10-13, that:

This polarization rotation orients the output fields emerging from fibers F1 and F2 in parallel when they enter the Mach-Zehnder interferometer (MZ1).

Thus, like Bethune, it is the polarized photons F1 and F2 that are received by the time means.

Hence, Applicants submit that the feature of randomly polarized photons being received by a time delay means is a feature not taught or suggested in Moeller et al.

Finally, Applicant submits that the applied references both *teach away* from the claimed invention. The Court in In re Gurley, 31 USPQ2d 1130 (Fed. Cir. 1994) stated that:

A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or *would be led in a direction divergent from the path that was taken by the applicant*. The degree of teaching away will of course depend on the particular facts; in general, a reference will teach away if it suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the applicant. [Emphasis added.]

As discussed above, both Bethune and Moeller et al establish well defined polarization orientations before the photons are time delayed. Such techniques *teach away* from the presently claimed invention.

KSR International Co. v. Teleflex Inc. et al. 2007 U.S. LEXIS 4745 reinforced the role of “teaching away” in deciding obviousness. The Court stated that:

In *United States v. Adams*, 383 U. S. 39, 40 (1966), a companion case to *Graham*, the Court considered the obviousness of a wet battery that varied from prior designs in two ways: It contained water, rather than the acids conventionally employed in storage batteries; and its electrodes were magnesium and cuprous chloride, rather than zinc and silver chloride. The Court recognized that when a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result. 383 U. S., at 50-51. It nevertheless rejected the Government’s claim that Adams’s battery was obvious. The Court relied upon the corollary principle that when the prior art *teaches away* from combining certain known elements, discovery of a successful means of combining them *is more likely to be nonobvious*. *Id.*, at 51-52. [Emphasis Added.]

Thus, with neither Bethune nor Moeller et al disclosing the feature of randomly polarized photons being received by a time delay means, and with both Bethune and Moeller et al teaching away from the claimed invention, Applicants submit that Claim 1 patentably defines over Bethune and Moeller.


Independent Claims 14, 27, and 31 define features similar to those discussed above with regard to Claim 1.

Accordingly, independent Claims 1, 14, 27, and 31 (and the claims dependent therefrom) are believed to patentably define over the art of record.

Consequently, in view of the present amendment and in light of the above comments, no further issues are believed to be outstanding, and the present application is believed to be in condition for allowance. An early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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